NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

FOREST STAND IMPROVEMENT

(Acre)

CODE 666

DEFINITION

The manipulation of species composition, stand structure, and stocking by cutting or killing selected trees and understory vegetation.

PURPOSES

- To increase the quantity and quality of forest products, e.g., sawtimber, veneer, wood fiber, poles, pilings, maple syrup, naval stores, nuts and fruits.
- To harvest forest products.
- To initiate forest stand regeneration.
- To reduce the potential of damage from wildfire, pests, and moisture stress.
- To restore natural plant communities.
- To achieve a desired understory plant community.
- To improve aesthetic, recreation, and open space values.
- To improve wildlife habitat.
- To improve water conservation and yield.
- To achieve a desired level of crop tree stocking and density.
- To increase carbon storage in selected crop trees.

CONDITIONS WHERE PRACTICE APPLIES

All forestland where improvement of forest resources is needed.

CRITERIA

General Criteria Applicable To All Purposes

The harvest-regeneration strategy will be identified for all planned forest improvement harvesting:

- Uneven-aged management systems (single-tree selection, group selection, coppice selection)
- Even-aged management (clear-cut, seed-tree, shelterwood, coppice)

The extent or size of treatment area shall achieve the intended purpose.

Preferred tree and understory species are identified and retained to achieve all planned purposes. The selection of trees to cut and trees to leave should be based on management objectives and adaptability of species to the soil. Adaptability can be determined by using Forestland Interpretations in Section II of the Field Office Technical Guide or by accessing the web at http://plants.usda.gov, going to Plant Tools, and utilizing Veg Spec.

Trees should be cut that are diseased, insect infested, suppressed, severely damaged in harvesting operations, or have poor genetic qualities.

Spacing, density, size class, number, and amounts of trees and understory species to be retained will follow established guidelines for the intended purposes.

Tree Spacing

Intermediate cuttings should provide the better trees left in the stand with sufficient growing space for a given number of years.

D + X is the familiar way to express (D+X)

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squared, the growing space required by a tree for normal growth over a given number of years. "D" represents the DBH (diameter breast height) of a tree and "X" is an added constant to give normal growing space to leave trees. In most cases "X" will be "6" for pine. "X" varies with the average stand diameter for hardwoods.

Ave. DBH	Pine (D+6)	Hardwoods
6"	12'	
8"	14'	16'
10"	16'	19'
12"	18'	22'
14"	20'	25'
16"	22'	28'

Other methods of achieving proper spacing are crown closure and basal area guides.

Cutting Cycle

A cutting cycle is the interval between cuts on the same area. This interval varies with species, site index and stocking. For fully stocked healthy stands, the following table will serve as a guide to cutting cycle:

Site Index	Pine	Up-land Oaks	Oak - Gum	Cotton-wood
50	9 yrs	9 yrs		
60	8 yrs	8 yrs		
70	7 yrs	7 yrs		
80	6 yrs	6 yrs	11 yrs	
90	5 yrs		10 yrs	7 yrs
100	4 yrs		9 yrs	6 yrs

Cutting cycles are based on 2 inches of diameter growth for pine and upland hardwoods and 4 inches of diameter growth between harvest on oak-gum and cottonwood.

Harvest Cutting

The term "harvest cutting" as used in this practice refers to harvesting merchantable trees in addition to intermediate cuttings. They are trees considered to be financially mature because of condition, site, species, age, or management objectives.

Even-aged Pine plantations will be clearcut upon maturity and replanted to the desired species adapted for the soil.

Management to achieve all aged stands (uneven-aged management) is desirable for woodland owners with combined stands of Pine and hardwoods. This allows for sustained harvests over time and is beneficial when managing for wildlife. Timber stands with a basal area of over 110 square feet per acre are considered overstocked and need to be thinned with a harvest cut. The desired basal area per acre is between 70 and 110 square feet.

Crop trees can be selected in groups to create openings from 100 feet to 200 feet in diameter to benefit wildlife (except as noted below.) When natural reproduction is absent, at least 8 well distributed seed trees per acre should be left for stand regeneration.

Areas lacking suitable seed trees and stands not naturally regenerated within two years should be planted to the most suitable species.

Newly established seedlings, natural or planted, should be released from undesirable competition within two years after establishment, preferably the first year following establishment.

Wild fire prevention is necessary at all times for all forest types.

Chemical Treatments

Species such as redbud, plum, dogwood and holly should be left in selected areas for aesthetics. A minimum of four (4) wildlife food trees per acre, such as oak, hickory, mulberry, and beech should be left in selected areas for wildlife. Direct sunlight is one of the key requisites for maximum production of fruits, nuts, and acorns. Limited numbers of den trees may also be preserved, particularly if the landowner is interested in managing his woods for dual use of woodland and wildlife resources.

Soil erosion, displacement and compaction, hydrologic impact and damage to remaining vegetation shall not exceed acceptable levels.

Slash, debris and vegetative material left at the site after treatment shall not present an unacceptable fire or pest hazard or interfere with the intended purpose.

The extent, size of treatment area or intensity of the practice shall not exceed acceptable levels for the intended purpose and cumulative ecosystem effects.

Comply with applicable laws and regulations.

In all cases, the information contained in these standards is superseded by instructions of the herbicide label.

Tree Injection. Use a Tree Injector or Hypo-Hatchet to inject the appropriate dosage of herbicide for the intended species. Calibrate injection device according to herbicide label dosage instructions. Make injections at 2 to 3 inch intervals completely around the tree. Refer to herbicide label for spacing recommendations.

Difficult to control species may need continuous cut rather than spaced cuts - hickory and dogwood are examples. This method may be used year round except during period of heavy sap flow for species such as maple.

Frill. Frill unwanted individual trees of all species of 3" DBH and larger. Make a single hack girdle or "frill" of overlapping axe cuts through the bark completely around the tree as close to the ground as feasible. Spray or paint the injured surface with diluted or undiluted herbicide, depending on herbicide label, using enough volume to wet treated areas. This method can be used year round, except during period of heavy sap flow for species such as maple. Use all herbicides in accordance with label instructions.

Basal Spray. Treat only trees less than 6" DBH. Spray the lower 12" to 15" of the tree trunk, wetting to the ground line. Spray until runoff at ground line is noticeable. This method is useable during any season, except when water or snow prevents spraying to ground line. Use all herbicides in accordance with label instructions.

Stump. Spray the sides and cut surface of freshly cut (within 30 minutes) stumps with the herbicide. The cambium area next to the bark is the most vital area to wet. This method can be done during any season. Use all herbicides in accordance with label instructions.

Soil Applications. Calibrate rate depending on soil texture and/or size of herbicide mixture agitated. Respraying may be necessary. This method is applicable trees to be controlled. Consult herbicide label. This method is usually done from March to early June. Use all herbicides in accordance with label instruction.

Foliar Spraying. Use appropriate equipment for spraying undesirable hardwood species. Avoid offsite drift. Keep herbicide mixture agitated. Respraying may be necessary. This method is applicable in spring and early summer after foliage has fully developed. Use all herbicides in accordance with label instructions.

Stocking guidelines shall contain stocking in terms of basal area, spacing or trees per acre by species and size class distribution.

The area will have a minimum of 300 well distributed trees per acre of desirable species and quality that need releasing from competition of undesirable trees. Where the minimum number of desirable species is not present, the area should be planted as set forth in the Tree/Shrub Establishment standard (612).

The method, felling direction and timing of tree cutting for harvesting shall facilitate efficient and safe tree removal and protect sensitive areas such as vernal pools, riparian zones, cultural resources, and structures. Refer to Riparian Forest Buffer standard (391).

Forest stand improvement activities shall be performed to minimize soil erosion, compaction, rutting, and damage to remaining vegetation and hydrologic conditions.

Slash and debris left on the site after treatment will not present an unacceptable fire, safety, environmental, or pest hazard. Such remaining material will not interfere with the intended purpose or other management activities.

Comply with applicable federal, state and local laws and regulations during the installation, operation and maintenance of this practice.

CONSIDERATIONS

Silvicultural objectives and harvest-regeneration strategies may change over time and may be limited by prior management.

Successful regeneration of desirable species is usually dependent upon timely application of forest stand improvement and other practices, e.g., prescribed burning, site preparation, tree

and shrub establishment, prescribed grazing and use exclusion.

The extent, timing, size of treatment area, or the intensity of the practice should be adjusted to minimize cumulative effects (onsite and offsite), e.g., hydrologic and stream alteration, habitat fragmentation, nutrient cycling, biodiversity and visual resources.

Potential landowner and operator liability should be assessed before forest stand improvement activities begin.

The practice should be timed to minimize disturbance of seasonal wildlife activities.

Consider wildlife food and cover needs when making modifications to forest composition and tree spacing.

Consider retention of selected dead and dying trees, including down material, to enhance wildlife habitat values.

Landowners should secure a written contract with any service provider that specifically describes the extent of activity, duration of activity, responsibilities of each party and amount and timing of payments for services provided

Consider environmental concerns such as threatened and endangered species and natural areas.

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

Periodic inspections during treatment activities are necessary to ensure that objectives are achieved and resource damage is minimized. Follow-up and ongoing management activities will be needed to obtain desired results.

REFERENCES

NRCS Field Office Technical Guide, Section II - "Forestland Interpretations".

NRCS - "Tree Planting - Central and Western Oklahoma".

NRCS National Forestry Manual.

NRCS National Forestry Handbook.

OSU Extension Facts No. 5015, "Farm Woodland Improvement".

OSU Extension Facts No. 5028, "Even and Uneven Aged Forest Management".

OSU Extension Facts No. 5030, "Tree Improvement in Oklahoma Woodlands".

OSU Extension Facts No. 5034, "Riparian Forest Buffers".

OSU Extension Facts No. 5035, "Selling Your Timber".

OSU Extension Facts No. 5036, "Deciduous Trees for Oklahoma".

OSU Extension Video Tape No. 178, "American Tree Farm Showcase".

OSU Extension Video Tape No. 264, "Logging, Best Management Practices and Water Quality".